Chapter I6: Benefits Analysis for the Monroe Facility

This chapter presents the results of EPA's evaluation of the economic benefits associated with reductions in estimated current I&E at the Monroe facility. The economic benefits reported here are based on the values presented in Chapters I4 and I5, and EPA's estimates of I&E at the facility (see Chapter I3). Section I6-1 presents a summary of I&E losses and associated monetized losses. Section I6-2 presents estimated economic benefits of reduced I&E, and Section I6-3 discusses the uncertainties in the analysis.

CHAPTER CONTENTS

I6-1 Overview of I&E and Associated Economic Values

The flowchart in Figure I6-1 summarizes how the economic values of I&E losses at Monroe were derived from the I&E estimates in Chapter I3. Figures I6-2 and I6-3 indicate the distribution of I&E losses by species category and associated economic values. These diagrams reflect baseline losses based on current technology. All dollar values and percentages of losses reflect midpoints of the ranges for the categories of commercial, recreational, nonuse, and forage values.

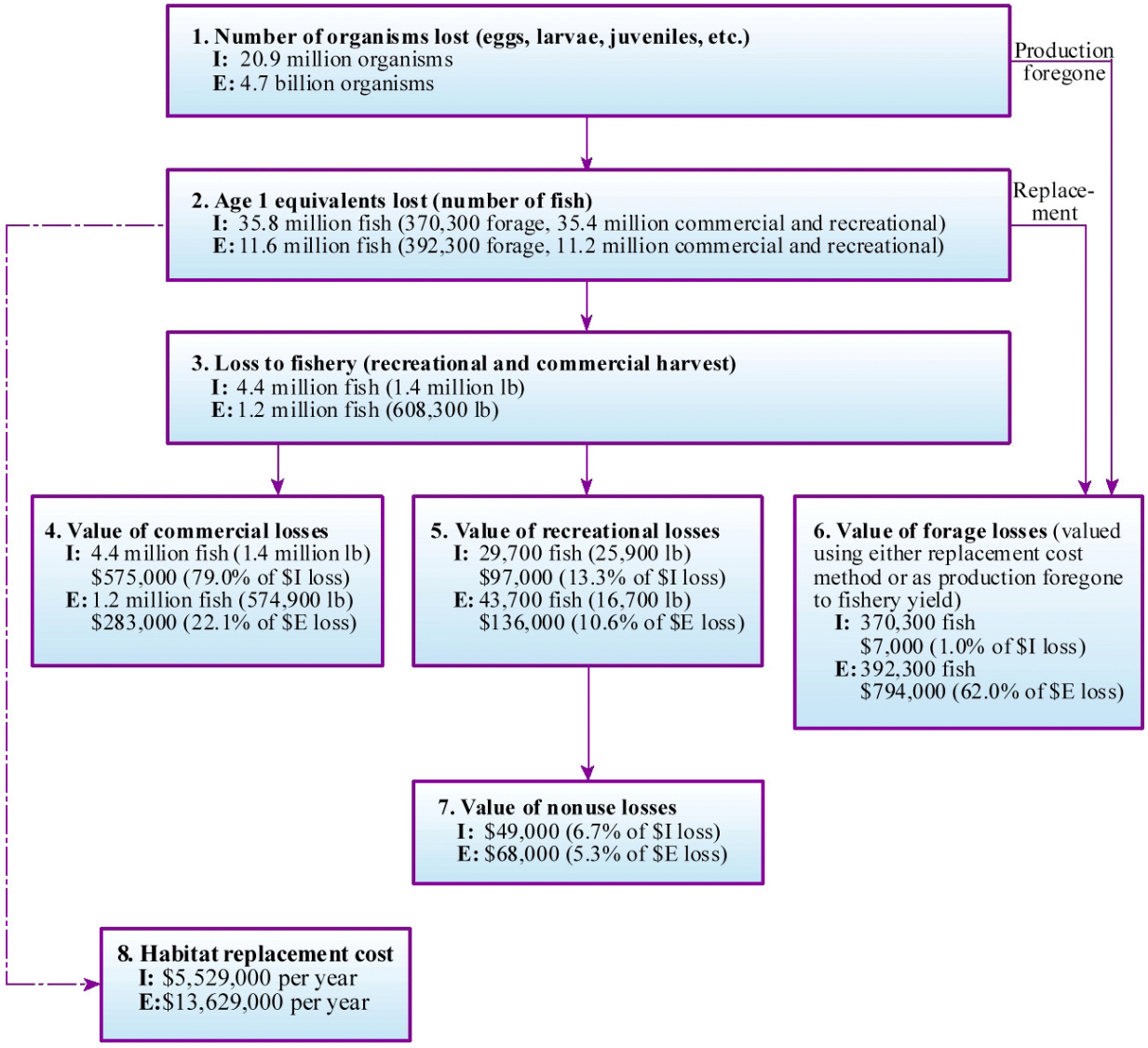
Baseline economic losses due to I&E at Monroe were calculated in Chapters I4 and I5. In Chapter I4, total economic loss was estimated using a benefits transfer approach to estimate the commercial, recreational, forage, and nonuse values of fish lost to I&E. This is a demand-driven approach, i.e., it focuses on the values that people place on fish. In Chapter I5, total economic loss was estimated by calculating the cost to increase fish populations using habitat restoration techniques (HRC approach). This is a supply-driven approach, i.e., it focuses on the costs associated with producing fish in natural habitats.

The total annual economic losses associated with each method are summarized in Table I6-1. These values range from $727,000 to $5,529,000 for impingement, and from $1,281,000 to $13,629,000 for entrainment. The range of economic loss is developed by taking the midpoint of the benefits transfer results and the 90th percentile species results from the HRC approach.

I6-2 Potential Economic Benefits due to Regulations

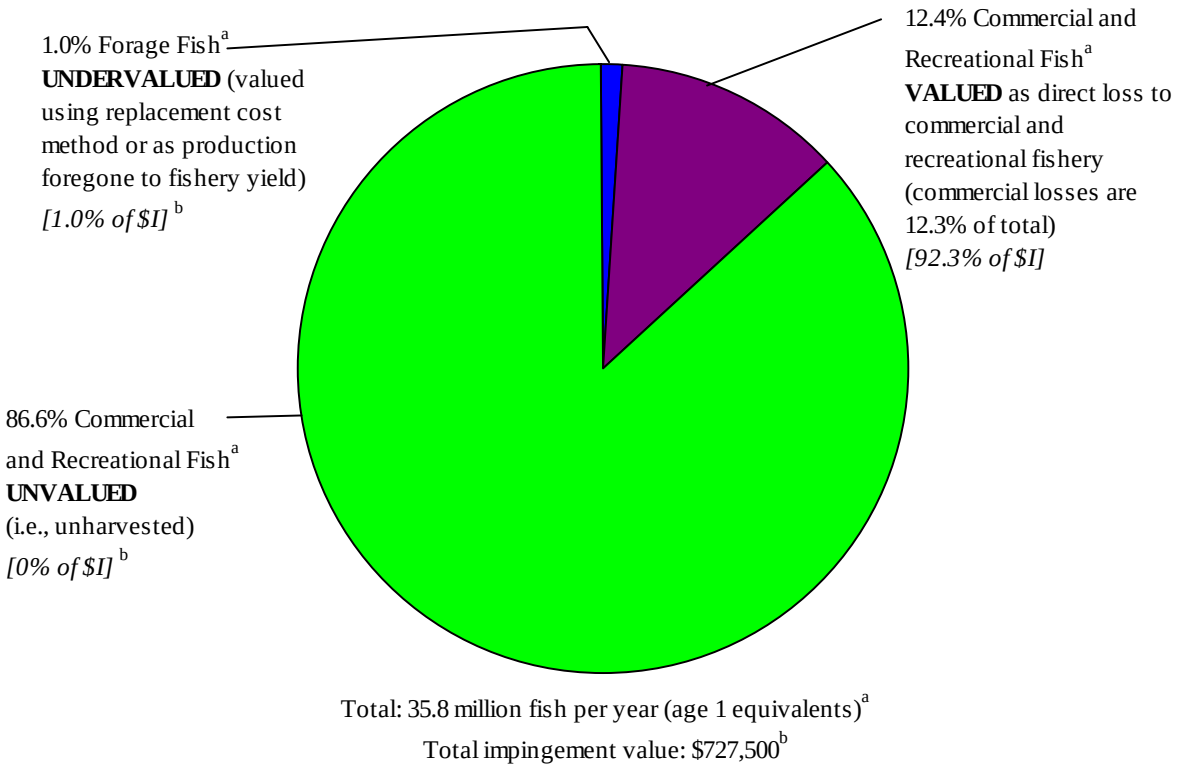
Table I6-2 summarizes the total annual benefits from I&E reductions under scenarios ranging from 10 percent to 90 percent reductions in I&E. Table I6-3 indicates that the benefits are expected to range from $582,000 to $4.4 million for a 80 percent reduction in impingement and from $640,000 to $6.8 million for a 50 percent reduction in entrainment.

Figure I6-1: Overview and Summary of Average Annual I&E and Associated Economic Values for the Monroe Facility (all results are annualized)[a,b]



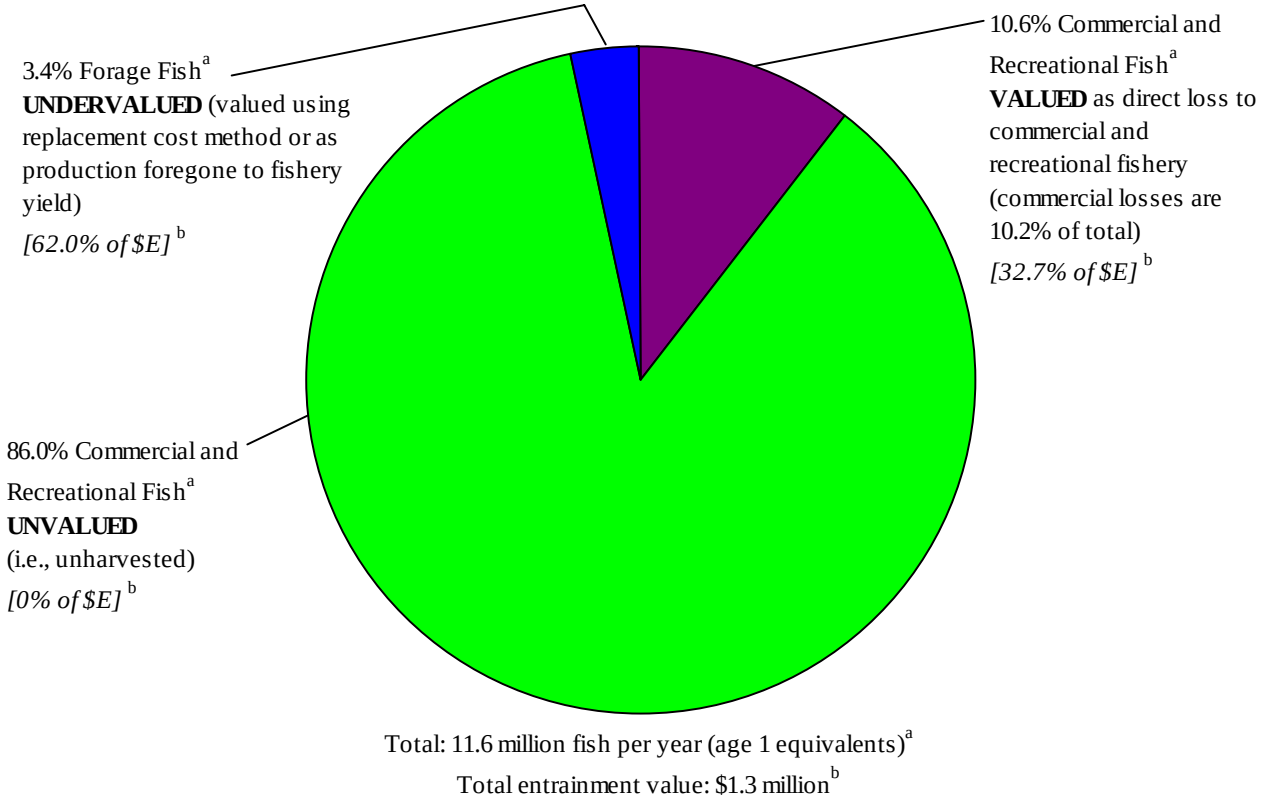
[a] All dollar values are the midpoint of the range of estimates.
[b] I&E loss estimates are from Tables I4-2, I4-3, I4-9, and I4-10 in Chapter I4.
Note: Species with I&E < 1% of the total I&E were not valued.

Figure I6-2: Monroe: Distribution of Impingement Losses by Species Category and Associated Economic Values



[a] Impacts shown are to age 1 equivalent fish, except impacts to the commercially and recreationally harvested fish include impacts for all ages vulnerable to the fishery.
[b] Midpoint of estimated range. Nonuse values are 6.7% of total estimated $I loss.

Figure I6-3: Monroe: Distribution of Entrainment Losses by Species Category and Associated Economic Values



[a] Impacts shown are to age 1 equivalent fish, except impacts to the commercially and recreationally harvested fish include impacts for all ages vulnerable to the fishery.
[b] Midpoint of estimated range. Nonuse values are 5.3% of total estimated $E loss.

Table I6-1: Total Baseline Economic Loss from I&E (2000$, annually)

	Impingement	Entrainment
Benefits transfer approach (demand driven approach from Chapter I4)[a]	$727,000	$1,281,000
Habitat replacement cost approach (supply driven approach from Chapter I5)[b]	$5,529,000	$13,629,000
Range	$0.7 million to $5.5 million	$1.3 million to $13.6 million

[a] Midpoint of Range from Chapter I4.
[b] Based on cost to restore 90th percentile species impacted. Note that the lower bound estimates from the HRC approach reflect restoration of only half the impacted fish species (i.e., the 50th percentile). As such, the low end values for HRC were not considered in establishing the range of losses.

Table I6-2: Summary of Current Economic Losses and Benefits of a Range of Potential I&E Reductions at Monroe Facility ($2000)

		Impingement	Entrainment	Total
Baseline losses	low	$727,000	$1,281,000	$2,008,000
	high	$5,529,000	$13,629,000	$19,158,000
Benefits of 10% reductions	low	$73,000	$128,000	$201,000
	high	$553,000	$1,363,000	$1,916,000
Benefits of 20% reductions	low	$145,000	$256,000	$402,000
	high	$1,106,000	$2,726,000	$3,832,000
Benefits of 30% reductions	low	$218,000	$384,000	$602,000
	high	$1,659,000	$4,089,000	$5,747,000
Benefits of 40% reductions	low	$291,000	$512,000	$803,000
	high	$2,211,000	$5,452,000	$7,663,000
Benefits of 50% reductions	low	$364,000	$640,000	$1,004,000
	high	$2,764,000	$6,815,000	$9,579,000
Benefits of 60% reductions	low	$436,000	$769,000	$1,205,000
	high	$3,317,000	$8,177,000	$11,495,000
Benefits of 70% reductions	low	$509,000	$897,000	$1,406,000
	high	$3,870,000	$9,540,000	$13,410,000
Benefits of 80% reductions	low	$582,000	$1,025,000	$1,607,000
	high	$4,423,000	$10,903,000	$15,326,000
Benefits of 90% reductions	low	$655,000	$1,153,000	$1,807,000
	high	$4,976,000	$12,266,000	$17,242,000

Table I6-3: Summary of Benefits of Potential I&E Reductions at Monroe Facility ($2000)

		Impingement	Entrainment	Total
80% impingement reductions and 50% entrainment reductions	low	$582,000	$640,000	$1,222,000
	high	$4,423,000	$6,815,000	$11,238,000

I6-3 Summary of Omissions, Biases, and Uncertainties in the Benefits Analysis

Table I6-4 presents an overview of omissions, biases, and uncertainties in the benefits estimates. Factors with a negative impact on the benefits estimate bias the analysis downward, and therefore would raise the final estimate if they were properly accounted.

Table I6-4: Omissions, Biases, and Uncertainties in the Benefits Estimates

Issue	Impact on Benefits Estimate	Comments
Long-term fish stock effects not considered	Understates benefits[a]	EPA assumed that the effects on stocks are the same each year, and that the higher fish kills would not have cumulatively greater impact.
Effect of interaction with other environmental stressors	Understates benefits[a]	EPA did not analyze how the yearly reductions in fish may make the stock more vulnerable to other environmental stressors. In addition, as water quality improves over time because of other watershed activities, the number of fish impacted by I&E may increase.
Recreation participation is held constant[a]	Understates benefits[a]	Recreational benefits estimated via benefits transfer reflect only anticipated increase in value per activity outing; increased levels of participation are omitted.
Boating, bird-watching, and other in-stream or near-water activities are omitted[a]	Understates benefits[a]	The only impact to recreation considered is fishing.
Effect of change in stocks on number of landings	Uncertain	EPA assumed a linear stock to harvest relationship, that a 13 percent change in stock would have a 13 percent change in landings; this may be low or high, depending on the condition of the stocks.
Nonuse benefits	Uncertain	EPA assumed that nonuse benefits are 50 percent of recreational angling benefits.
Use of unit values from outside the Great Lakes	Uncertain	The recreational and commercial values used are not all studies from the Great Lakes specifically.
HRC based on capture data assumed to represent age 1 fish	Understates benefits[a]	High percent of less than age 1 fish observed in capture data, thereby leading to potential underestimate of scale of restoration required
HRC monitoring program costs for wetland restoration not consistent with evaluating fish production/abundance	Understates benefits[a]	A monitoring program to determine wetland production (abundance of fish) would be more labor intensive than current monitoring program.

[a] Benefits would be greater than estimated if this factor were considered.